



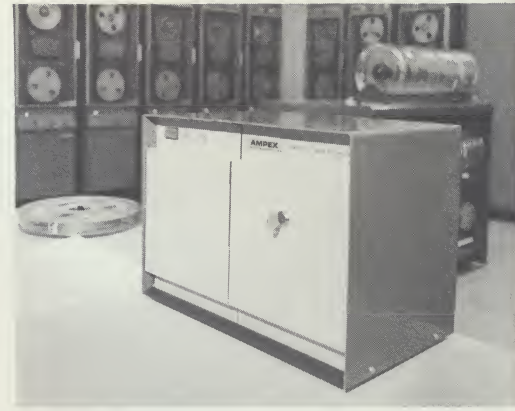
AMPEX

CDR-1

Commercial Data Recorder

A new concept for recording, reproduction and storage in systems designed for commercial and industrial data acquisition and transmission, machine and process control, and computer input/output. An incremental magnetic tape recorder using a tape cartridge. Offers the unique capability of instant verification.

Ampex leadership in magnetic tape technology has coupled the many advantages of magnetic tape recording with an incremental recording capability and the convenience of tape cartridges in the CDR-1 Commercial Data Recorder.



The AMPEX CDR-1 Commercial Data Recorder provides increased capability and speed at low cost.

THE AMPEX CDR-1 Commercial Data Recorder represents a new, low cost approach to recording and storage of digital data in systems designed for use in commercial data transmission, machine tool or process variables control, factory data acquisition, data logging and related applications. In many such systems now using paper tape, punched cards, or other input/output equipment, the CDR-1 can bring improved performance, lower cost, and new capability.



How the Ampex CDR-1 can bring increased capability

BANKING AND COMMERCIAL TRANSACTION DATA

In automated systems for handling banking entries, stock transactions, centralized bookkeeping data, sales, shipments, or mail order placement and billing, the CDR-1 can add increased capability and speed at low cost. In outlying offices this type of data can be readily batched together on magnetic tape for faster, more efficient transmission to a central office for processing. Typical input devices include typewriters, adding machines, keypunches and similar office devices. Output rate of the CDR-1 can be selected to optimize use of expensive transmission facilities. Outlying stations have the option of erasing and reusing the magnetic tape for additional data, or storing the cartridge for future data retrieval.

IN-PLANT DATA LOGGING

In-plant data such as time and motion studies, costs or scheduling data can be conveniently stored on the CDR-1 for analysis at a central processing station. In typical systems, the CDR-1 can be used with keyboards, typewriters, counters, level indicators and similar input equipment. Analysis of this data allows rapid, accurate assessment of costs, schedules and manpower allocation.



The **AMPEX CDR-1** Commercial Data Recorder

- **Magnetic Tape...An Ideal Dynamic Storage Medium** Magnetic tape is an ideal dynamic medium for data acquisition, reproduction and storage. Magnetic tape can be played as many times as desired (as for example in machine or process control), or it can be put into permanent storage. If a permanent record is not required, it can be erased and reused thousands of times, resulting in significant savings over paper tape or cards which can only be used a limited number of times and cannot be reused for new data.

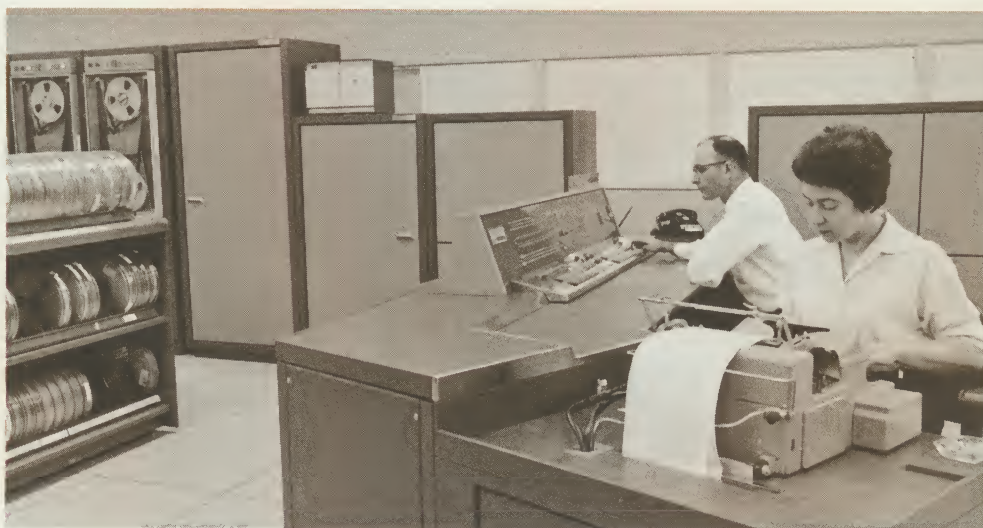
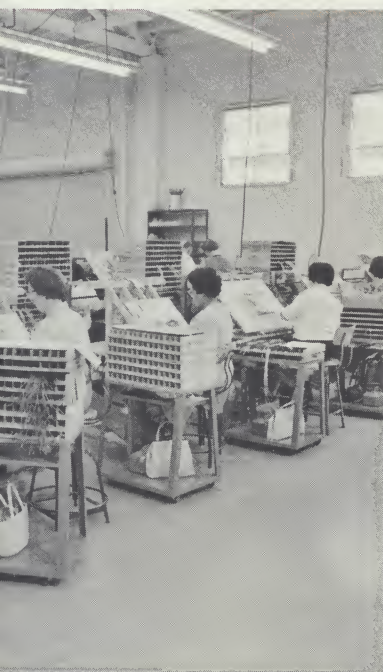
- **Records Incrementally from Random or Continuous Sources.** By means of its incremental drive system, the Ampex CDR-1 will accept digital inputs from slow or random sources (as well as from synchronous sources) without intermediate buffering, and still maintain uniform bit packing density (200 bits per inch) on the magnetic tape. Typical input data might be derived from a typewriter, adding machine, character key board, process variable transducer or sensor, counter, level indicator, or similar device. The rate of the incremental steps is determined by the rate of the input data. This rate can vary from 0 to 300 times per second, some three to fifteen times faster than typical paper tape punches. On playback, any fixed rate from 75 to 480 bits per second for each channel (3,840 bits per second maximum), can be provided for versatility in matching input requirements of transmission lines, computers, or readout devices. Data can be played back in either the forward or reverse direction.

- **Verifies Data Immediately After Writing.** The CDR-1 verifies each recorded bit immediately after

writing. After verification, which occurs a few milliseconds after writing, it is ready for the next character. This unique instant verification, which is not possible with conventional NRZ recording (or with paper or card devices), is achieved by the use of an RB (return to bias) recording technique. RB recording also reduces current in head windings, simplifying construction, increasing reliability and reducing standby power requirements.

- **Tape Cartridges for Operator Ease.** For ease of operation by nonskilled personnel, the Ampex CDR-1 uses a convenient tape cartridge with integral tape reels which eliminates threading, rewinding, and handling of the tape. Cartridges are completely interchangeable on any CDR-1. They can be inserted or removed in seconds. Physical protection of the tape is another advantage offered by the cartridge, especially important in crowded, busy and often contaminated industrial environments such as warehouse, machine shop or assembly line. For permanent storage or shipping, the cartridge also serves as an integral container to provide physical protection for valuable data. In systems using 4 (or fewer) digit codes, recording time and storage capacity on the CDR-1 cartridge can be doubled by recording the entire length of the tape, then turning the reel over and recording on the other unused tracks of the tape. CDR-1 cartridges are reversible and are labeled "Side A" and "Side B" for this purpose. For normal operation, an interlock prevents reversability.

in these systems:



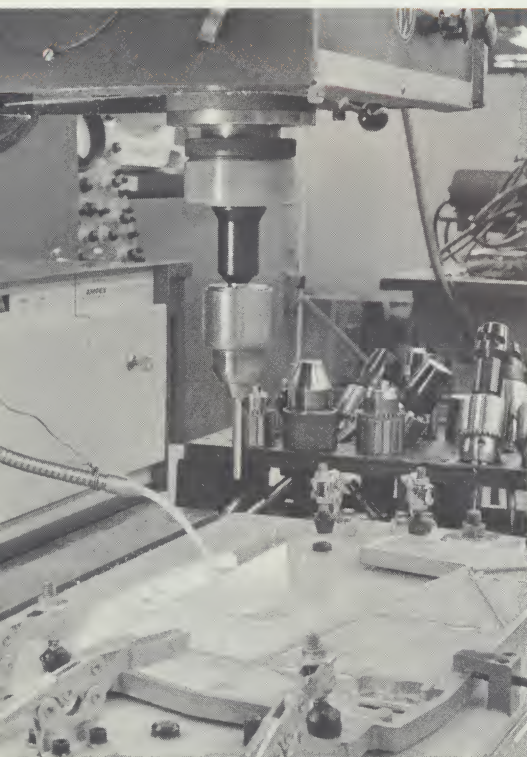
COMPUTER INPUT/OUTPUT

For computation of data collected on CDR-1 cartridges, a CDR-1 recorder located at the processing center can serve as a direct input device to the computer. Similarly, as a computer output device, a CDR-1 can record computations from the original data (or other sources) to provide the warehouse or logging station with current status reports or in machine and process control, with

control variables. In this usage, the CDR-1 can readily be connected to the computer in manner similar to that used for other input/output devices, such as punches, readers or typewriters, in order to bring increased speed and capability. For general purpose use with computers, the CDR-1 can also be used in place of conventional input/output devices, where it is desirable to have increased speed at moderate cost.



- **High Bulk Storage.** The tape cartridge on the CDR-1 can store 8.4×10^5 eight-bit characters. This is equal to seven 1,000-foot rolls of paper tape, providing a savings in both space and cost over other commonly used media. Magnetic tape also offers a much greater life, both in operational life (recording, reproduction, erase, re-recording) and storage life, than other media.
- **Simple Operation...Interlock Protection.** The CDR-1 has only one operating control—an on/off switch. A key provides access to the tape cartridge chamber. Inserting or removing a cartridge requires only seconds. All other operations are controlled remotely by the input and output devices. A ready light and a power-on light indicate machine condition. To insure proper operation by non-technical personnel, interlocks are provided on the cartridge chamber, beginning and end of tape, and other points.
- **Combined Read/Write for Lower Cost, Plus Remote Operation.** The Ampex CDR-1 combines reading and writing in one package, permitting completely automatic operation without operator attention or handling of the recording media. In initial cost and operating economy, the CDR-1 can compete with many paper tape systems which are, typically, separate punch and reader devices.
- **Accepts New ASCII and Other Code Formats.** The CDR-1 writes up to eight tracks, parallel or serial format, permitting the use of any standard code, including the new eight-character ASCII code (American Standard Code for Information Interchange), plus 4, 5 (teletype), 6, or 7 (flexowriter) digit codes. Write and read electronics are modular in construction to allow system expansion and to permit versatility in designing a system for standard codes with fewer than eight tracks. Extra space is provided in the card file for modules with specialized interface circuitry.
- **Provides Improved Accuracy.** Accuracy of the CDR-1 magnetic tape system is better than one error in ten million (1 in 10^7). In comparison, paper tape and cards can only provide an accuracy one or two magnitudes lower. Error detection is also inherent in the CDR-1 by means of its ability to actually verify each character immediately after recording.
- **Improved Reliability.** Ruggedly built on a precision single-piece casting like more complex computer and instrumentation recorders, the CDR-1 has built-in long-term reliability. Simplicity of design and conservative components result in minimum routine maintenance. Under normal operating conditions, cleaning the heads is the only maintenance necessary. A new unit can be installed in a few minutes.
- **Permits the Optimum Use of Communication Facilities.** For transmission of data such as stock quotations, inventory information, bank entries, airline or travel reservations, and similar data over telegraph, telephone, microwave or other transmission links, the CDR-1 can provide a significant improvement in usage of these facilities. Data contained in the CDR-1 tape cartridge can be read out at a fixed rate that optimizes expensive transmission line facilities. Typical transmission equipment that can be used with the CDR-1 are Bell System 202 and 402 Series Dataphones.



MACHINE TOOL CONTROL

For machine and process control, the CDR-1 offers increased accuracy, speed, and reliability, plus physical protection of valuable data. In industrial environments, the integral housing afforded by the cartridge itself protects the tape from dirt, dust, metal particles and other contaminants. Any number of tape cartridges can be prepared on a write-only or read/write CDR-1 for use on read-only versions at the work site. Alternatively, data can be transmitted on communications facilities from a CDR-1 located in a computer or processing center, to the work station for writing and subsequent reading on-site. In some systems, a printed readout with special instructions can be provided with each cartridge.

INVENTORY CONTROL

In outlying depots, records of received and outgoing parts or components are conveniently logged on the CDR-1 for high speed transmission to processing centers (up to 480 characters per second). Inputs to the CDR-1 can be completely random since it writes the data, then stops and waits for another input. If desired, information can be collected for periodic batch input into the recorder at rates up to the maximum of 300 characters per second.



CDR-1 VERSIONS

- **Write-Only** — For use in outlying data acquisition stations such as a warehouse, shipping or receiving department, mail order receiving point, and similar data accumulating stations. Operation can be by operator or automatic control. CDR-1 write-only versions are less expensive than comparable 300 characters per second (or even some slower) paper punch devices. In control applications, a write-only version is useful in systems where tapes for use on read-only versions at the machine or process site are prepared in a central facility. In write-only systems, tape cartridges are carried or sent to a central processing center for computation, processing or storage. One module with eight channels is employed in write-only versions. Provision for deleting any character is included on this module.
- **Read-Only** — Useful in a central computer or processing center receiving tape cartridges from data collection stations, or on-site work stations for reading machine or process control data. Output of read-only version is, typically, fed to a transmission line,

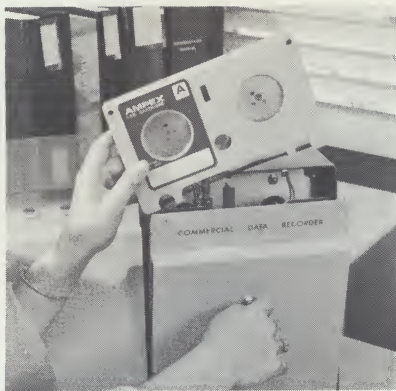
computer, machine or process controller.

- **Read/Write/Verify** — For immediate verification while writing data. In these versions, incoming data is written and the tape begins to step to its next position. During this period, the written signal is read and compared with the input signal, which has been held in a register for this purpose. As a result of verification, an error absent or error present signal is delivered to the external equipment. In read/write versions, the fundamental feature of magnetic tape — ability to erase and re-record — makes it possible to use a single cartridge to record data, transmit to some central point, then rewind and reuse the same tape. If instead of erasing and reusing the tape, you wish to store information for a period of time at the acquisition station, a new cartridge can easily be inserted. The integral housing of the tape cartridge provides a storage container as well as physical protection of data. Circuitry is included to insert a delete character upon command.

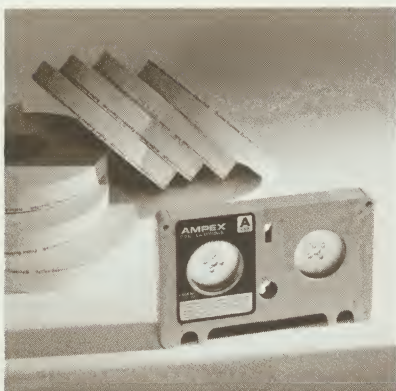
COMMERCIAL DATA TRANSMISSION

Tape cartridges containing typical commercial data (stock quotations, bank entries, sales, or travel reservations) can be fed into telephone, telegraph, microwave or other transmission links at a rate that optimizes use of these facilities. Collection of the data can be completely random; then at a convenient time (as for example when rates are lower), the data can be fed in at a much faster rate than with conventional equipment. The savings in cost for use of transmission facilities alone may justify installation of an automated system with the CDR-1.





Ampex CDR-1 tape cartridge eliminates threading and rewinding for ease of operation by non-skilled operators and protects the tape in industrial environments. Cartridges are completely interchangeable in any CDR-1 recorder.



CDR-1 magnetic tape cartridge for ease of operation and interchangeability—requires no threading or rewinding. Will store 8.4×10^5 eight-bit characters, equal to seven rolls of 1,000-foot paper tape. Protects the magnetic tape during use and shipping.

REPLACEMENT PARTS AND OTHER BACK-UP SERVICES

To guarantee long-term operation of the CDR-1, Ampex maintains a world-wide organization providing complete back-up services. These services extend from experienced application engineering to comprehensive maintenance facilities and replacement parts, supported by skilled service technicians in the field. Only Ampex Corporation, with its 18-year history as the leader in magnetic recording can offer this combination: Advanced design, precision manufacturing, long-term reliability and world-wide back-up services.

Engineering representatives in principal cities throughout the world.

The AMPEX CDR-1 Commercial Data Recorder

GENERAL DESCRIPTION

Recording Medium

Magnetic tape, 1/2-inch, 1-mil base MYLAR, * 350 feet long, contained in a cartridge with integral flanged reels. Cartridge eliminates threading and rewinding onto supply reel. Each cartridge can contain 6,720,000 bits of data. Tape can be erased and reused (approximately 20,000 passes) or placed in permanent storage. Cartridge provides integral storage container, and physical protection of the tape.

Write Mode

Incrementally controlled, at a rate from 0 to 300 bits per second for each channel (2400 bits per second maximum), as controlled by the rate of the input data.

Read Mode

Any one fixed output from 75 to 480 bits per second for each channel (3,840 bits per second max.) to match characteristics of transmission line or readout device. Output rate can readily be changed to meet modified system requirements. Reading can be in either the forward or reverse direction.

Verification

Each character is verified immediately after writing (within 2 milliseconds). Control voltages for error absent or error present are supplied as outputs to peripheral equipment.

Format

Up to 8 bits in any format, such as 4, 5 (teletype), 6, 7 (flexowriter) or 8 bit formats, including the new ASCII code.

Recording Technique

Return to Bias (RB) at 200 bits per inch. RB recording allows immediate verification of each character as it is recorded.

Start or Stop Distance

At maximum output data rate, approximately 0.20 inch each.

Fast Forward and Rewind Time

Approximately 30 seconds.

Controls

Power on/off. (Key opens tape cartridge chamber).

Indicators

Ready and Power On.

Signals from External Equipment

All operations of the CDR-1, except on/off and loading the cartridge, are controlled by the external system. Control signals required are: Write, Incremental Step, Read, Delete, Fast, Forward, Reverse and Erase.

Signals from CDR-1

Signals to the external system indicating the condition of the CDR-1 are: Ready/Not Ready, Write Permit, Beginning Of Tape, End Of Tape, Error Absent/Error Present, Read Strobe.

Interlocks

Write permit (prevents unintentional writing), door closed, cartridge properly inserted, tape properly tensioned, tape unbroken, tape not at beginning or end of tape.

Electronics

Plug-in modules with two complete channels in read/write or read only versions. Space for 4 external interface modules. Write only version contains 8 channels in single module. Modular electronic construction permits expandability and versatility to match system design.

Maintenance

Minimal preventive maintenance normally limited to cleaning heads.

Reliability

1 error in 10^7 bits.

Environment

Approximately 40° to 125°F, 20 to 95% relative humidity. Positive pressure system prevents entry of dust or other contaminants. Covers, seals and air filter integral to design.

Size

Approximately 12 inches high, 10 inches deep and 17 inches wide. Standard 19-inch rack adapter available.

Weight

Approximately 65 pounds.

Power Requirements

117 volts, 50 or 60 cps, or 230 volts, 50 or 60 cps, single phase AC.

Mounting

Self-contained portable cabinet; can also be rack-mounted in standard 19-inch rack.

*TM DuPont Corp.



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